Solow Model Assignment
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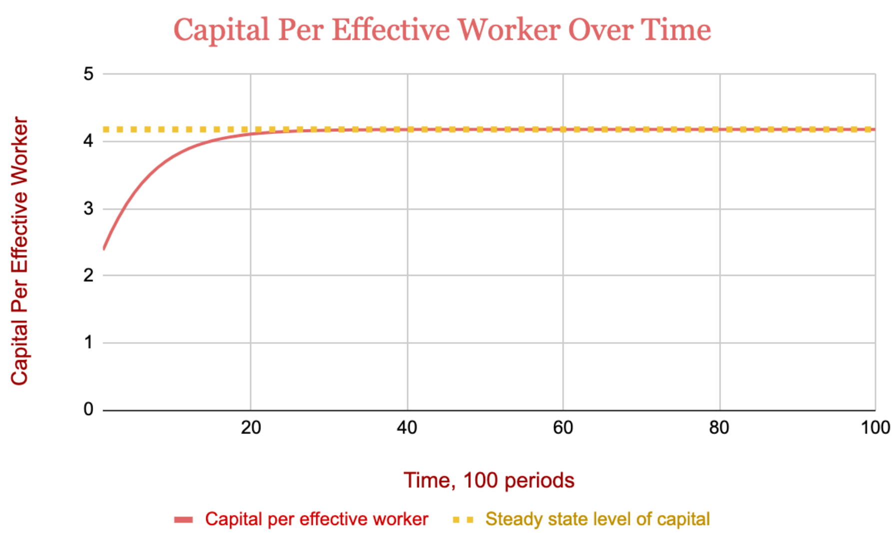
Link to Google spreadsheet:
https://docs.google.com/spreadsheets/d/1r3eCE_1Mo5Kzh3U9eAfk5Kl529U6lW7wpkIV2K91N6k/edit?usp=sharing

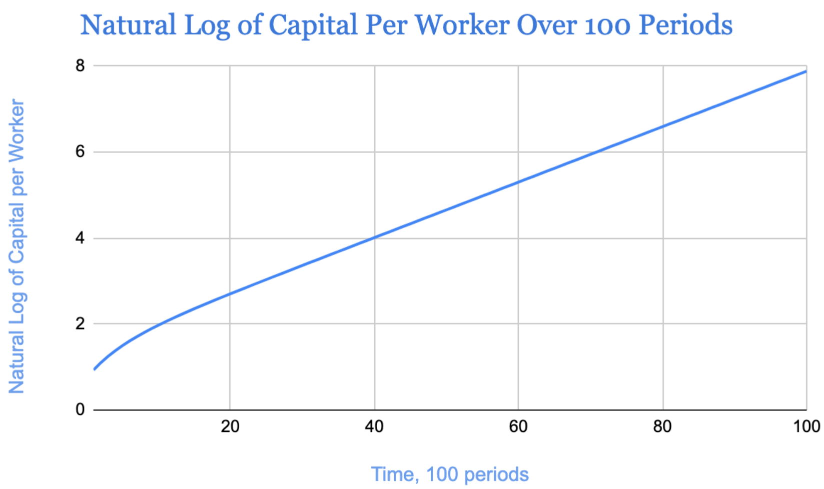
Problems #1-8 are calculated on the spreadsheet linked above on the sheet named "Steady State Q1-Q8".

For problem 2, the steady state capital per worker is 4.18198, steady state output per worker is 1.77236, and steady state consumption per worker is 0.531709. Formulas are also included on the first sheet of the Google sheet in blue.

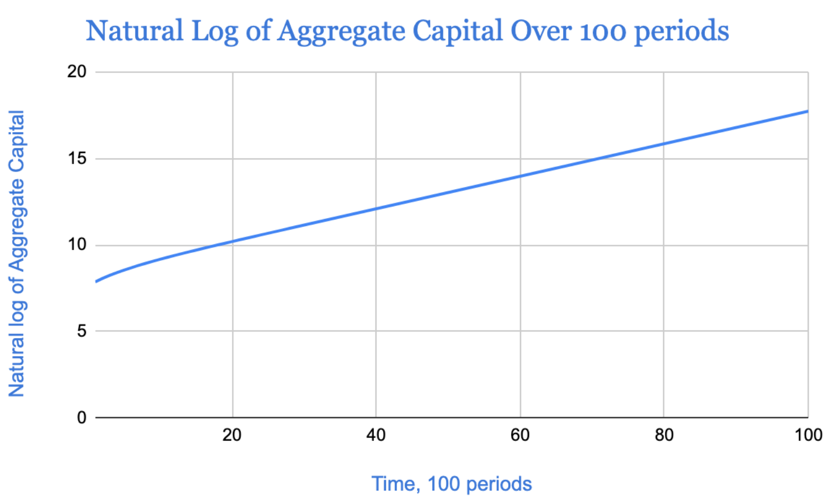
#8 Graphs:



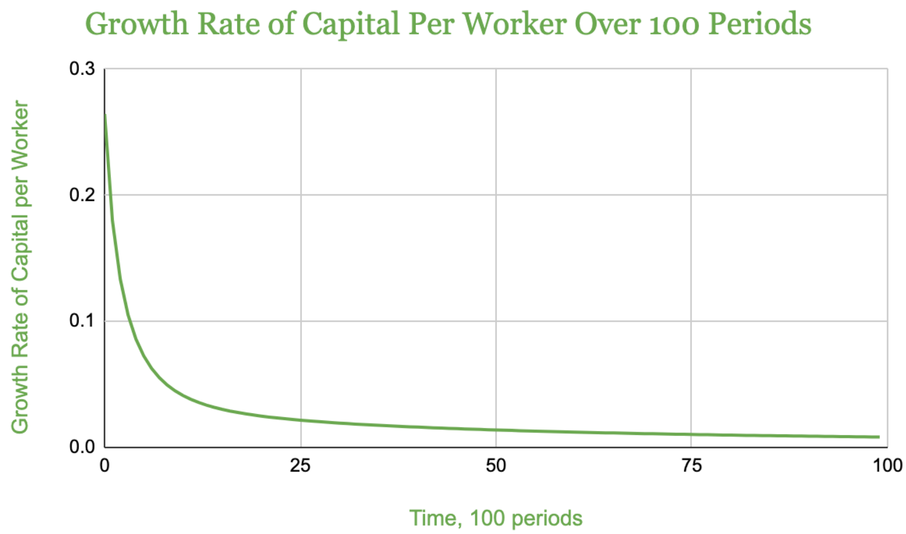
This graph shows the Capital per Effective Worker over time, where time is given from periods 0 to 100. The steady state is defined when capital per worker reaches a constant level over time, and here, we can see that the red line that represents capital per effective worker, also known as k tilde, reaches a constant. The yellow dotted line represents the level at where steady state capital is, which is 4.18198.



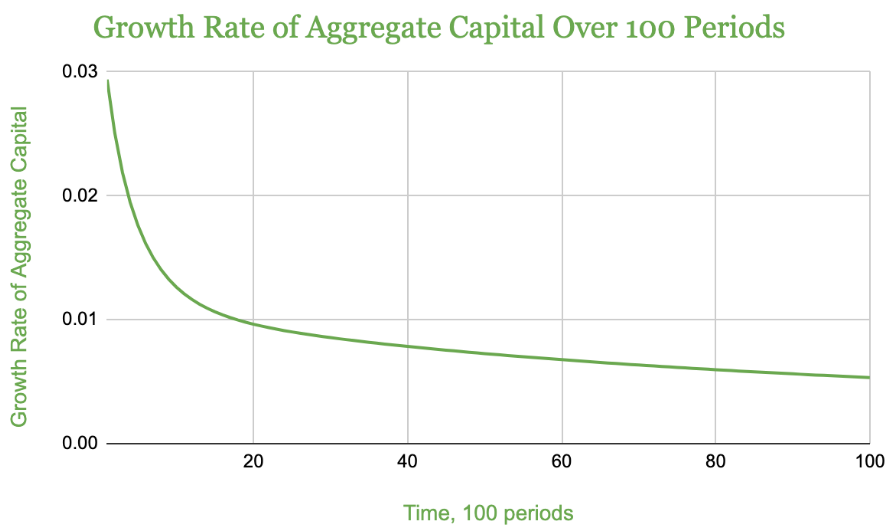
For this graph, the natural log is applied to capital per worker over time periods 0 to 100. As the time period gets closer and closer to 100, we can see that the graph is approaching a steady state economy. When the economy is in steady state, the natural log of capital per worker will be linear, which is shown here in this graph. The slight curve in the beginning of the graph near time 0 to around time 20 is not linear because capital is not yet in steady state.



The natural log is applied to the aggregate capital over time periods 0 to 100. Much like the natural log of capital per effective worker, we can see a linear relationship between time and the natural log of aggregate capital as the economy approaches steady state. The slope of this graph is approximately equal to the growth rate of aggregate capital.



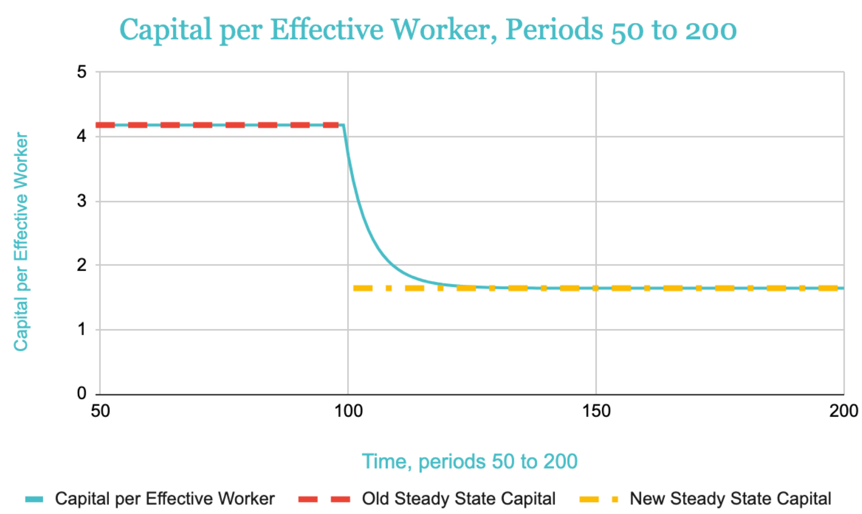
Graph 1



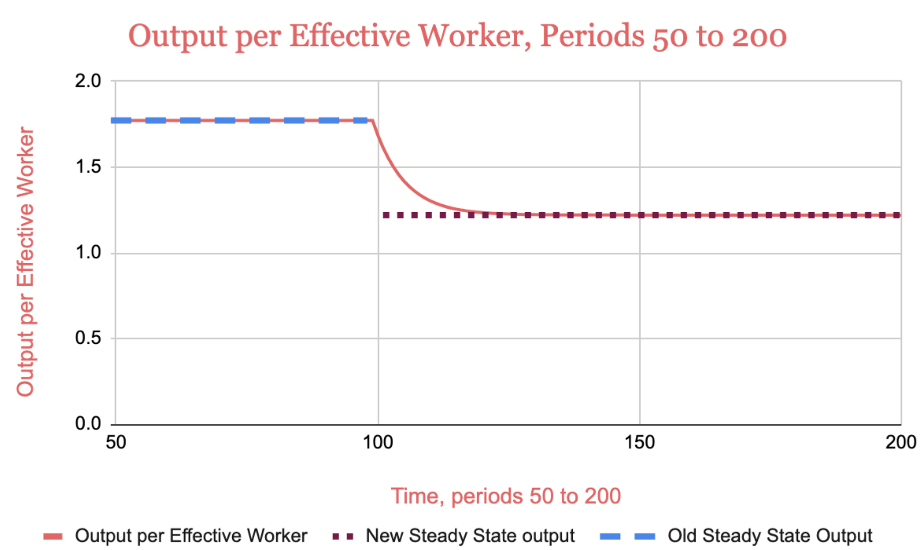
Graph 2

These two graphs illustrate the relationship between growth rate of capital per worker and time (graph 1), and the relationship between growth rate of aggregate capital and time, where time is from 0 to 100 periods. For both graphs, we can see that as aggregate capital and capital per worker go to steady state, the growth rate becomes a constant horizontal line.

#9

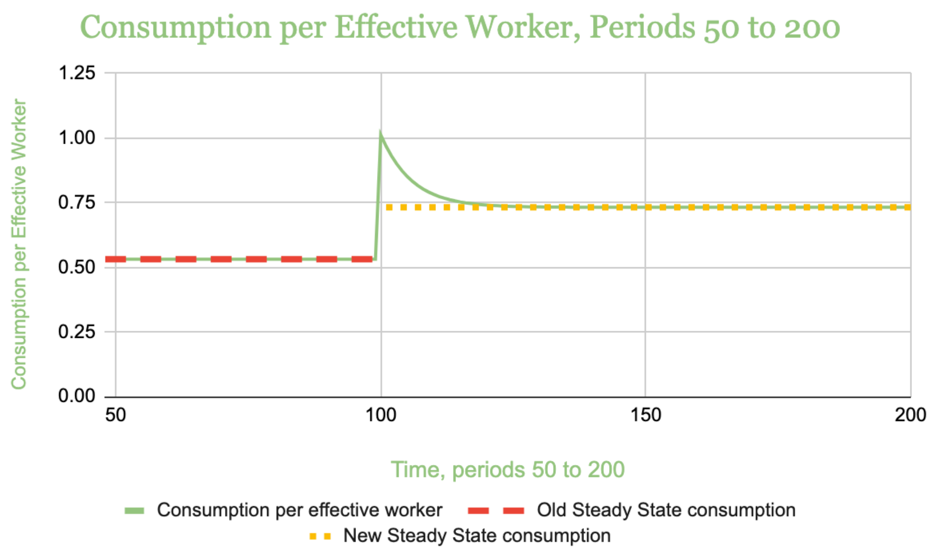


This graph shows the capital per effective worker starting off at period 50 with the old savings rate. At period 100, we changed the old savings rate to a new savings rate that optimizes steady state consumption. This rate is at 0.4, which is lower than the original savings rate, so the consumption per effective worker starts off at a higher steady state than where it ends. The red dashed line represents the old steady state capital with the old savings rate and the yellow dashed line represents the new steady state for the new savings rate.



This graph shows output per effective worker from periods 50 to 200. For this problem, we changed the savings rate from the original savings rate of 0.7, to the new savings rate that optimizes steady state consumption at period 100. The decrease in savings rate from the original savings rate shows a drop in the graph from the original steady state output that was given by the savings rate of 0.7. This drop occurs at period 100, the time that the savings rate changed. As output per worker reaches the new steady state output under the new savings rate, we can see the graph become constant again.

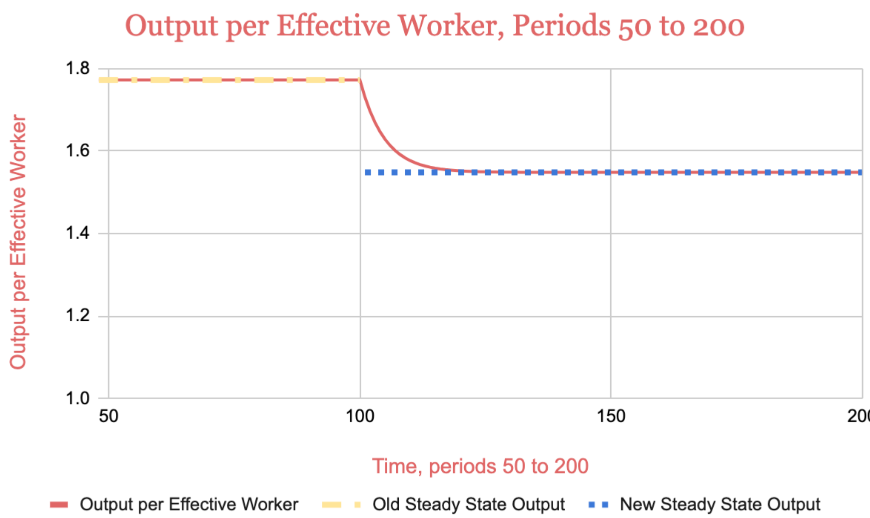
The blue dashed line represents the original steady state output, and the purple dotted line represents the new steady state output.



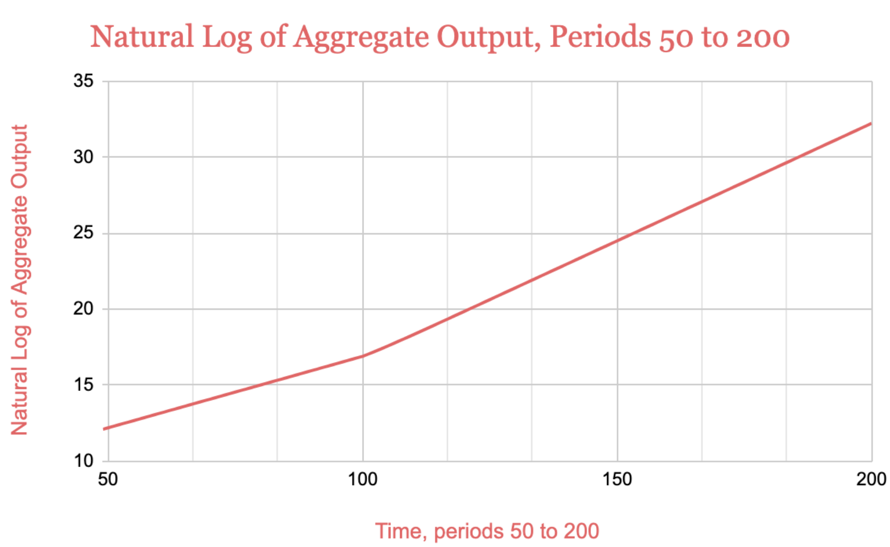
This graph shows consumption per worker given the old savings rate and the new savings rate. At the old savings rate, from time period 50 to 100, we can see that the steady state level of consumption per worker is lower than the consumption per worker after period 100. When we change the savings rate from 0.7 to 0.4 in order to optimize steady state consumption, we can see that the consumption per effective worker starts at a steady state constant, and when we change the savings rate at period 100, there is a sudden increase in consumption per effective worker before it finally levels off to the new steady state consumption given the new savings rate.

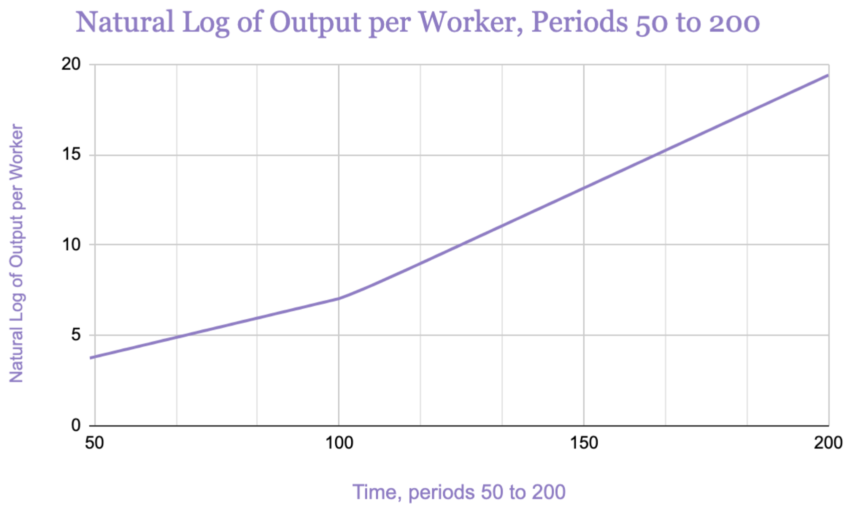
Red dashed line represents the old steady state consumption, and the yellow dotted line represents new steady state consumption.

#10

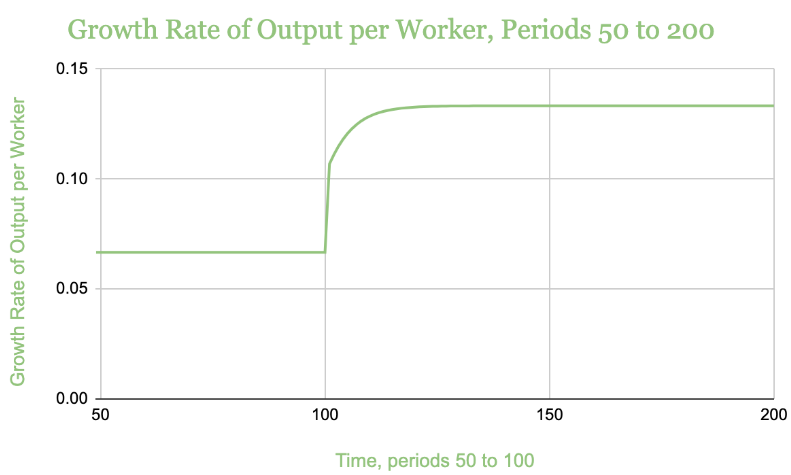


This graph shows output per effective worker before and after gamma tilde is doubled (gamma tilde is doubled at period 100. Before doubling gamma tilde, we can see that output per effective worker was at a higher steady state output than after. When gamma tilde doubled, there was a drop in output per effective worker, until it reached the new steady state output. When doubling gamma tilde, it creates a smaller k tilde (capital per effective worker), which then affects y tilde (output per efficient worker), thus giving a lower steady state output.

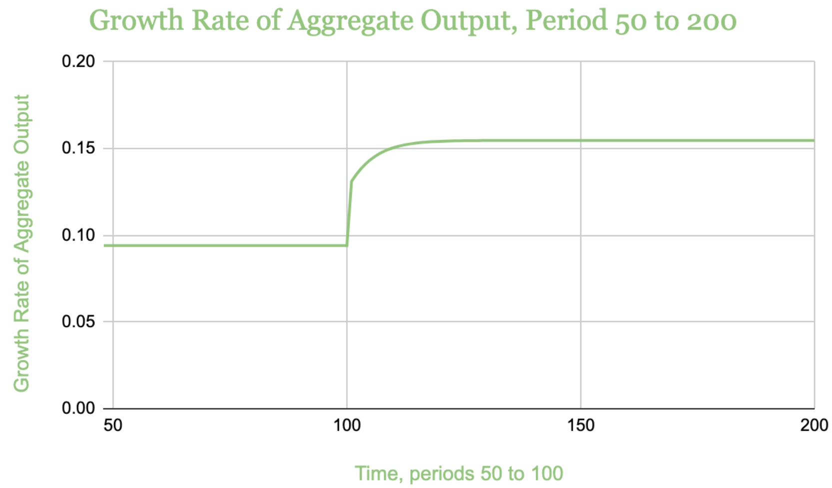




We can see that in these two graphs, the natural log of output per worker and the natural log of aggregate output from periods 50 to 200. The graphs show a pretty linear relationship because the economy is at steady state. The significance of these graphs is that before period 100, we can see a linear function that has a slope different from after period 100. For both functions, we can see that using the original gamma tilde, the line increases at a much slower rate than after doubling gamma tilde. When we double the gamma tilde at period 100, we can see that the linear function climbs at a much faster rate.



For this graph, we can see that the growth rate for output per worker is constant when the economy is in steady state. The growth rate, when it is in steady state, equals to gamma tilde. The original gamma tilde is constant at 0.6667, and when we double gamma tilde, we can see that the growth rate increased to become double the original growth rate at 1.3333. Gamma tilde is doubled at period 100.



This is the growth rate for aggregate output for time periods 50 to 100. The growth rate is constant when the economy is in steady state, and when we double the gamma tilde at period 100, we can see an increase from the old steady state. As the growth rate increases, it will start to level off onto a new steady state, which is higher than the old steady state,